REMARKS

Claims 23-44 remain in this application. Claims 31-44 are withdrawn.

CLAIM REJECTIONS - 35 USC § 103

At page 3, the Office Action rejects claims 23-30 under 35 U.S.C. § 103(a) as being unpatentable over GIANINAZZI-PEARSON et al. (Symbiosis (1989) 7: 243-255) in view of NAGAHASHI et al. (Mycol. Res. 104(12): 1453-1464, December 2000) and SAFIR et al. (US 5,002,603), and further in view of MANGNUS et al. (J. Agric. Food Chem. (1992) 40: 1230-1235). Applicants respectfully traverse the rejection.

Claim 23, as currently examined in view of the restriction requirement, is directed to a method of treating *Gigaspora rosea*, comprising contacting the fungi with a stimulating agent in an amount suitable for stimulating the development and/or growth of the AM fungi, the stimulating agent being GR24.

The Office Action takes the position that GIANINAZZI teaches treating spores of *Gigaspora* fungi with root exudates and that MANGNUS teaches the strigol analogue GR24. The Office Action combines these teachings to conclude that it would have been obvious to treat *Gigaspora* fungi with GR24. Applicants respectfully disagree with this conclusion.

GIANINAZZI describes studies undertaken to determine what possible components of root exudate could play a role in root symbiosis between AM fungi and their host plants. More specifically, GIANINAZZI studied whether flavonoids could stimulate germination of spores and hyphal growth of Gigaspora margarita (see, Abstract). GIANINAZZI states, "Several active components in root exudates have been identified as early plant signals and these appear to be flavonoids or isoflavonoids. Since such compounds occur widely in nature, we have studied the possibility that they may also be messenger molecules in early symbiont interactions in VAM." (See, page 244, 2nd paragraph). Accordingly, GIANINAZZI is limited to the treatment of *Gigaspora margarita* with root exudates, and in particular to the flavonoids naringenin, hesperitin and apigenin.

GIANINAZZI fails to teach or suggest anything related to treating *Gigaspora* with strigolactones, which are the class of chemical compounds featured in the present claims. GIANINAZZI fails to even recognize that strigolactones are present in root exudates. In fact, GIANINAZZI teaches away from the possibility of using strigolactones by limiting and focusing its analysis to flavonoids. Indeed, flavonoids and strigolactones have different chemical structures and are products of two different metabolic pathways, i.e. the phenyl propanoid pathway and the carotenoid (terpenoid) pathway, respectively.

As well recognized by one of ordinary skill in the art, and as detailed in the present specification, "Owing to the great complexity of the composition of these exudates, which contain thousands of molecules ranging from simple sugars, which are present in large concentrations, to much more complex molecules, which are present as traces . . . and despite the very large number of works which have already been carried out on this subject, the factor(s) actually involved in stimulating the development and growth of AM fungi has (have) still not been identified." (See, page 3, lines 21-28, emphasis added).

As further evidence of the chemical complexity of root exudates, Applicants provide herewith in the Appendix a non-exhaustive list of components which have been demonstrated to be components of root exudates (Annex I). This partial list is composed of about 200 molecules; indeed, plants exude several thousands of different molecules in soil.

The Office Action fails to provide any reasoning or rational in support of why one of ordinary skill in the art would select a strigolactone, such as GR24, for stimulating development and/or growth of *Gigaspora*. The Office Action has not provided any evidence, such as the citation to any prior art reference, that would teach or suggest the use of strigolactone in AM fungi.

The Office Action appears to have engaged in improper hindsight analysis in forming this rejection because the Office Action relies on information gleaned solely from Applicant's

specification. MPEP § 2142 states that "impermissible hindsight must be avoided and the legal conclusion must be reached on the basis of the facts gleaned from the prior art" (emphasis added). "'Any judgment on obviousness is in a sense necessarily a reconstruction based on hindsight reasoning, but so long as it takes into account only knowledge which was within the level of ordinary skill in the art at the time the claimed invention was made and does not include knowledge gleaned only from applicant's disclosure, such a reconstruction is proper'" (MPEP § 2145(X)(A), quoting *In re McLaughlin*, 443 F.2d 1392, 1395 (CCPA 1971), (emphasis added).

The Office Action relies on MANGNUS for teaching the use of the strigol analogue GR24 in treating *Gigaspora*. MANGNUS describes the ability of GR24 to promote the germination of seeds of two weeds - *Striga hermonthica* and *Orobanche crenata*. These plants are described as parasitic weeds which cause severe damage to graminaceous and leguminous crops in tropical and subtropical areas (see, Introduction). The teachings of MANGNUS cannot be applied to a method of treating arbuscular mycorrhizal fungi, such as *Gigaspora*.

The present application relates to AM fungi and the symbiotic interaction between a plant and a fungus. In contrast, MANGNUS relates to a parasitic interaction between two plants. One of ordinary skill in the art of the invention (the biology of symbiosis between plants and fungi) would not have considered the

teachings of MANGNUS, which specifically apply to the growth of the parasite plants *Orobanche* and *Striga*.

One of ordinary skill would not have been motivated to combine the teachings of GIANINAZZI, which is related to the growth of symbiotic fungus, and the teaching of MANGNUS, which is related to the growth of a weed parasite plant, for the following reasons:

1. Plants (*Orobanche*) and fungi (*Mycota*) are phylogenically so far away from each other that the taxonomic classification separates them into two Kingdoms, namely the *Plantae* kingdom including the organisms which are autotrophic according to the carbon source and, the *Fungi* kingdom including the organisms which are heterotrophic according to the carbon source,

2. *Striga* and *Orobanche* are parasites of plants whereas AM fungi are symbionts of plants.

GIANINAZZI and MANGNUS fail to teach or suggest that GR24, which is shown to induce the germination of parasitic weeds of the genera *Striga* and *Orobanche*, could induce the development and/or growth of AM fungi such as *Gigaspora rosea*.

The Office Action further relies on additional references, NAGAHASHI and SAFIR in this rejection. It's not particularly clear, but the Office Action appears to rely on these references for teaching the features further defined in the dependent claims, such as AM fungi in the form of root fragments,

seedlings, and cultivated host plants (see, page 3 of the Office Action). Like GIANINAZZI, however, NAGAHASHI and SAFIR detail the use of root exudates. These references fail to overcome the deficiencies noted above regarding the combination of GIANINAZZI and MANGNUS. NAGAHASHI and SAFIR fail to teach or suggest anthing related to the use of strigolactones, such as GR24, on AM fungi, such as *Gigaspora rosea*.

For all of these reasons, GIANINAZZI, NAGAHASHI, SAFIR and MANGNUS, in any combination, would not have rendered claims 23-30 obvious. Accordingly, Applicants request reconsideration and withdrawal of the rejection.

CONCLUSION

Entry of the above amendments is earnestly solicited. Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Should there be any matters that need to be resolved in the present application, the Examiner is respectfully requested to contact the undersigned at the telephone number listed below.

The Commissioner is hereby authorized in this, concurrent, and future submissions, to charge any deficiency or

credit any overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

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APPENDIX:

The Appendix includes the following item(s):

☒ – ANNEX I